



Designation: D8375 – 23

Standard Test Method for Determination of Cannabinoid Concentration in Dried Cannabis and Hemp Raw Materials using Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS)¹

This standard is issued under the fixed designation D8375; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method allows for the concentration determination of the cannabinoids listed in [Table 1](#), and shall apply to any dried raw material from a cannabis plant ([Note 1](#), [Note 2](#)) regardless of the type of cannabis plant from which it was derived.² For the sake of brevity, the term “cannabis” shall be used from now on to refer to any type of cannabis plant including those that can be classified as hemp. The procedure includes sub-sampling a ground, homogeneous sample, extraction with methanol:water (80:20, v:v),^{3,4} dilution in methanol and analysis by liquid chromatography tandem mass spectrometry (LC-MS/MS). The method allows for a wide-range of sample concentrations to be determined by using a 1000-fold calibration range and the option to perform multiple levels of sample dilution. The calibration curve is prepared in methanol over a range of 10 ng/mL to 10 000 ng/mL for all seventeen cannabinoids, or a subset of cannabinoids if desired, while the sample extracts are diluted in methanol into the calibration range.^{3,4,5} For example, a 1/500 dilution of sample extracts allows concentration determination over a range of 0.5 mg/g to 500 mg/g in cannabis. The method was validated with quality control samples prepared in methanol, a candidate certified reference material (CRM), and repeat extraction and analysis of cannabinoid samples.³

¹ This test method is under the jurisdiction of ASTM Committee D37 on Cannabis and is the direct responsibility of Subcommittee D37.03 on Laboratory.

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² Health Canada, Guidance Document: Good production practices guide for cannabis Testing for Phytocannabinoids.

³ McRae, G. and Melanson, J. E., Quantitative determination and validation of 17 cannabinoids in cannabis and hemp using liquid chromatography-tandem mass spectrometry, *Anal Bioanal Chem*, Vol 412, No. 27, 2020, pp. 7381–7393, doi:10.1007/s00216-020-02862-8.

⁴ Mudge, E. M., Murch, S. J., Brown, P. N., Leaner and greener analysis of cannabinoids, *Anal Bioanal Chem*, Vol 409, No. 12, 2017, pp. 3153–3163, doi: 10.1007/s00216-017-0256-3.

⁵ Vacklavik, L., Benes, F., Fenclova, M., Hricko, J., Krmela, A., Svobodova, V., et al. Quantitation of cannabinoids in cannabis dried plant materials, concentrates, and oils using liquid chromatography-diode array detection technique with optional mass spectrometric detection: single-laboratory validation study, first action 2018.11, *J AOAC Int*. Vol 102, No. 6, 2019, pp. 1822–33

NOTE 1—For this test method, dried raw material from a cannabis plant includes one or more of inflorescence, leaves, or stems.

NOTE 2—Certain jurisdictions or regulations may require specific parts of the plant to be included or excluded for analysis and those regulations will take precedence for the selection of plant parts.

1.2 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *List of Measurable Analytes*—See [Table 1](#).

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards*:⁶

D1193 Specification for Reagent Water

D8245 Guide for Disposal of Resin-Containing Cannabis Raw Materials and Downstream Products

D8270 Terminology Relating to Cannabis

D8282 Practice for Laboratory Test Method Validation and Method Development

E203 Test Method for Water Using Volumetric Karl Fischer Titration

3. Terminology

3.1 *Definitions*—For general terms related to cannabis, refer to Terminology [D8270](#).

3.2 *Definitions of Terms Specific to This Standard*:

⁶ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.